WELCOME

TO THE
SPI and CMM
COURSE

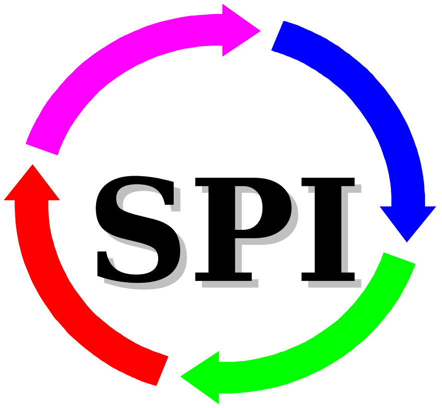
COURSE OBJECTIVES

TO PROVIDE A HIGH LEVEL OVERVIEW OF:

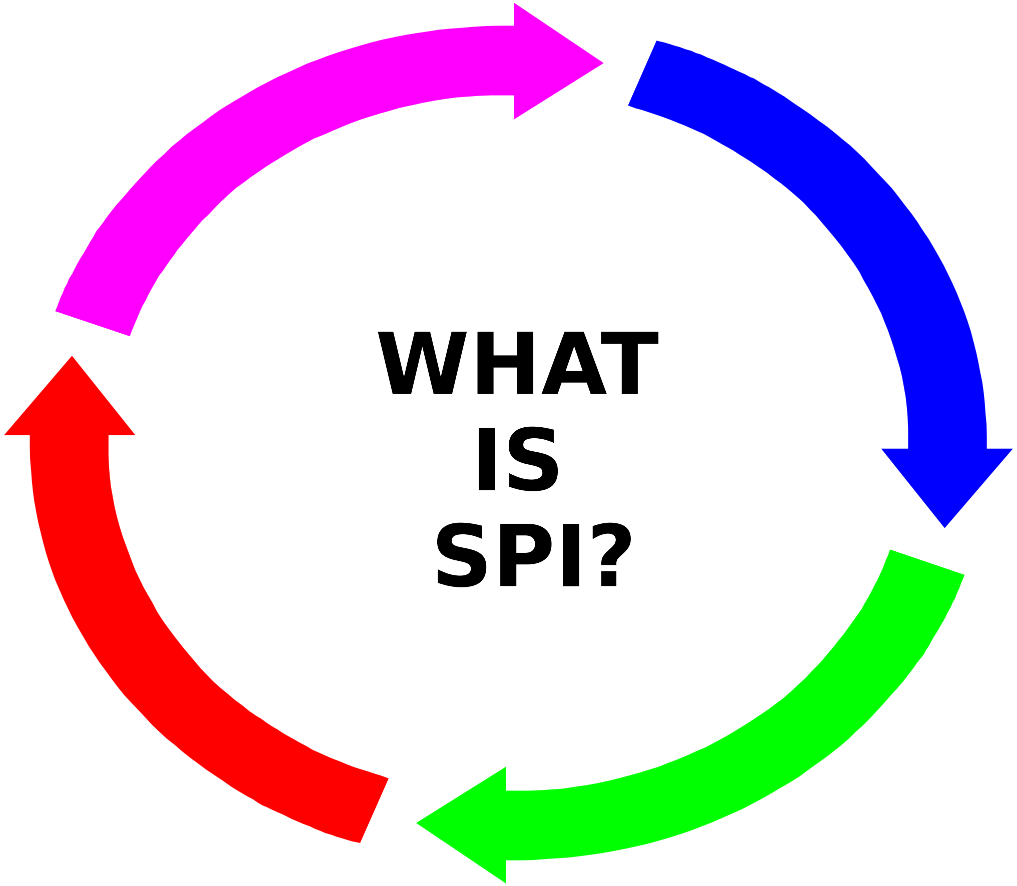
- SPI (Software Process Improvement)
- CMM (Capability Maturity Model)

SOFTWARE PROCESS IMPROVEMENT (SPI)

SOFTWARE PROCESS IMPROVEMENT (SPI) MODULE



- **MODULE OBJECTIVES:**
  - **WHAT IS SPI ?**
  - **WHY SPI ?**
  - **WHAT ARE GOALS /BENEFITS OF SPI ?**
  - **HOW IS SPI ACHIEVED/IMPROVED ?**
  - **WHAT IS DFAS's SPI STRATEGY ?**



WHAT IS SPI?

“**Software** is the entire set of programs,

procedures, and related documentation associated with a system and especially a computer system.”

Webster

“Process is the set of activities, methods, and practices which guide people and their tools in the development and enhancement of products.”

SEI

“Software Process

is the system of all tasks and the supporting tools, standards, methods, and practices involved in the production and evolution of a software product throughout the software life cycle.”

SEI

Improvement **is something**

that enhances value

or excellence.

SOFTWARE PROCESS IMPROVEMENT

IS

enhancement

to the

total software product.

WHY DO WE NEED SPI?

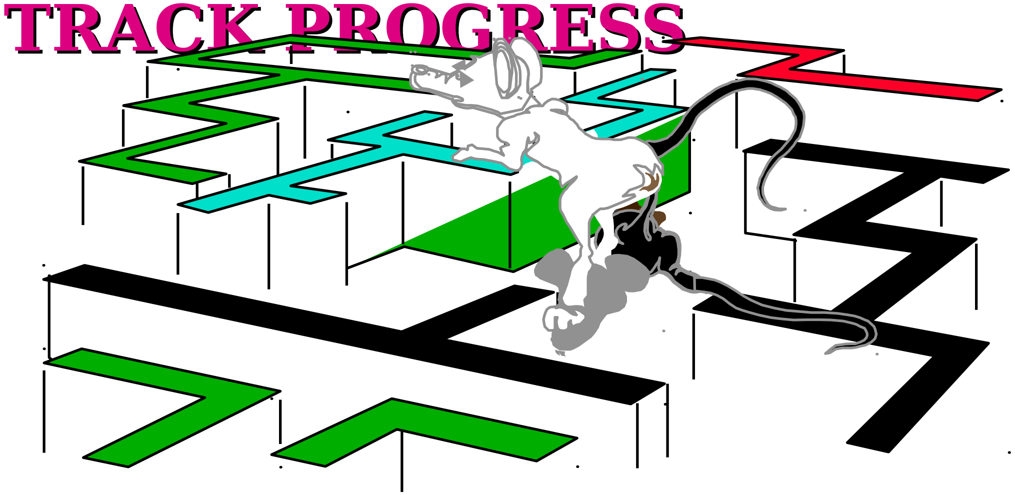
- DFAS REQUIREMENT FOR ALL CENTRAL DESIGN AGENCIES (CDAs)
- IMPROVE PROCESSES
- IMPROVE RELIABILITY & QUALITY
- IMPROVE EFFICIENCY
- REDUCE DEVELOPMENT COSTS

BENEFITS AND GOALS OF SOFTWARE PROCESS IMPROVEMENT

- INCREASED COMPETITIVENESS/QUALITY
- DECREASED COST
- SHORTEN DEVELOPMENT LIFE CYCLE
- PREDICTABLE QUALITY, COST, SCHEDULES
- PROCESSES DEFINED AND DOCUMENTED

TO ACHIEVE IMPROVEMENT, WE MUST:

- KNOW WHERE WE ARE
- KNOW WHERE WE WANT TO GO
- ASSIGN RESOURCES AND RESPONSIBILITIES
- IMPROVE AND DEFINE PROCESSES
- TRACK PROGRESS



DFAS SPI STRATEGY

- INCREASE SOFTWARE PROCESS CAPABILITY TO LEVEL 2 BY OCTOBER 1, 1995

- IMPLEMENT SPI AS ONE SINGLE PROGRAM WITHIN DFAS

- FOCUS ON DEFINING LEVEL 2 KPAs OF THE CMM

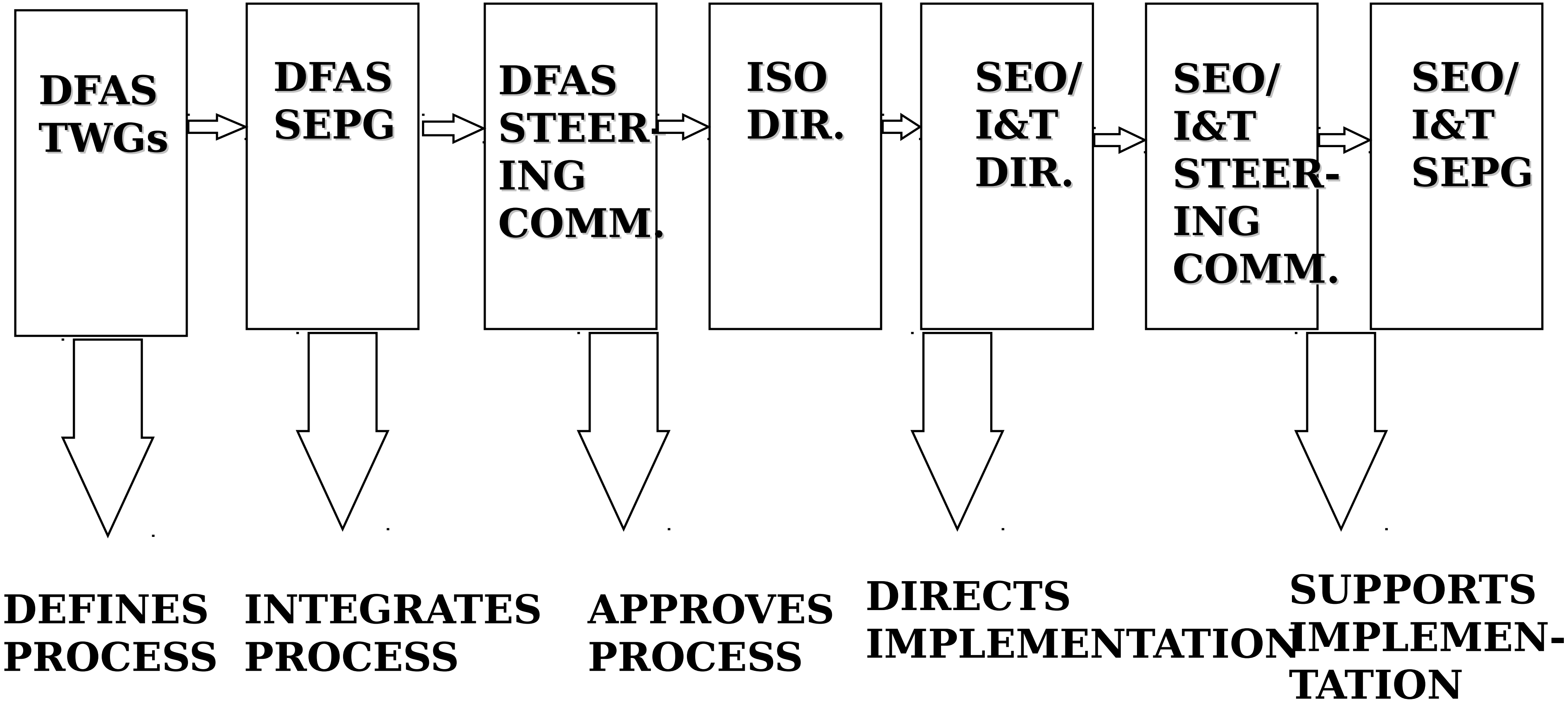
- DEVELOP CANDIDATE PROCESSES FOR STANDARDIZING

- IMPLEMENT APPROVED CANDIDATE PROCESS, PROJECT BY PROJECT, SITE BY SITE

WHAT IS *"THE BIG PICTURE?"*

THE DFAS SPI PROCESS

“THE *BIG* PICTURE”



DFAS TWGs → DFAS SEPG → DFAS STEER-ING COMM. → ISO DIR. → SEO/ I&T DIR. → SEO/ I&T STEER-ING COMM. → SEO/ I&T SEPG

DFAS TWGs: DEFINES PROCESS

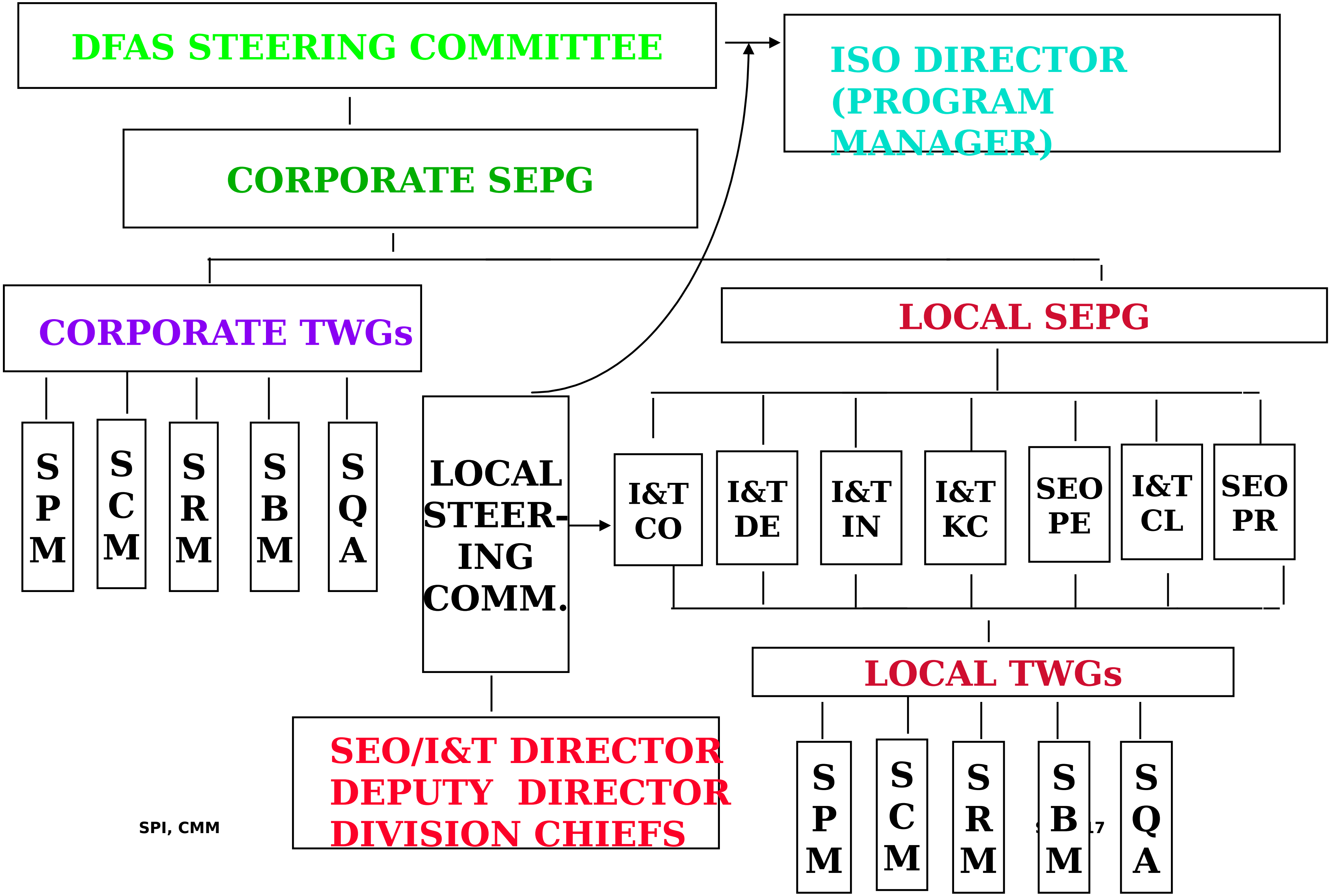
DFAS SEPG: INTEGRATES PROCESS

DFAS STEER-ING COMM.: APPROVES PROCESS

SEO/ I&T DIR.: DIRECTS IMPLEMENTATION

SEO/ I&T STEER-ING COMM.: SUPPORTS IMPLEMEN-TATION

ORGANIZATIONAL STRUCTURE



DFAS STEERING COMMITTEE

ISO DIRECTOR (PROGRAM MANAGER)

CORPORATE SEPG

CORPORATE TWGs

S P M

S C M

S R M

S B M

S Q A

LOCAL STEER-ING COMM.

LOCAL SEPG

I&T CO

I&T DE

I&T IN

I&T KC

SEO PE

I&T CL

SEO PR

LOCAL TWGs

S P M

S C M

S R M

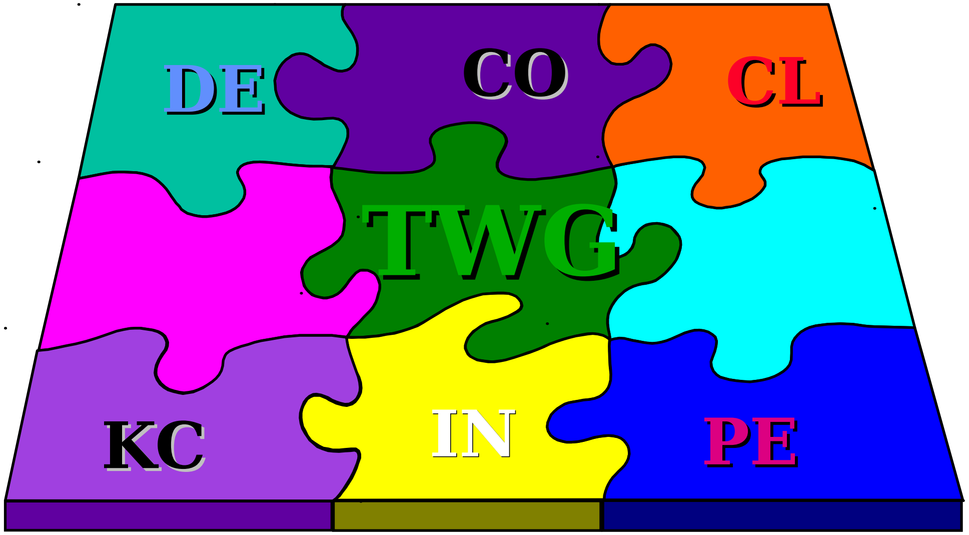
S B M

S Q A

SEO/I&T DIRECTOR
DEPUTY DIRECTOR
DIVISION CHIEFS

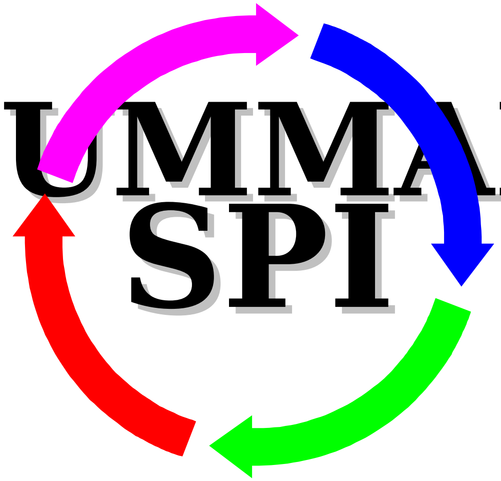
CORPORATE TWG STRUCTURE

- **EACH CORPORATE TWG CONTAINS :**
  - **ONE (1) MEMBER EACH OF THE SIX (6) SEOs/I&Ts**
  - **ONE (1) ISO MEMBER**



SOFTWARE PROCESS IMPROVEMENT (SPI)

SUMMARY SPI



SPI SUMMARY

- **WHO?**
  - **DFAS-HQ**
  - **INFRASTRUCTURE SERVICES ORGANIZATION**
  - **DFAS CENTERS AND SATELLITES...**
  - **SPI CANNOT SUCCEED WITHOUT EVERY EMPLOYEE’S HELP, SUPPORT AND COOPERATION TO ATTAIN THE GOAL OF...**

A QUALITY PRODUCT, ON-TIME AND AT AN AGREED-UPON PRICE!!!

SPI SUMMARY

- **WHAT?**

  SOFTWARE PROCESS IMPROVEMENT IS A LONG-TERM EFFORT TO:

  - ***ENHANCE THE MANAGEMENT OF SOFTWARE DEVELOPMENT***
  - ***IMPROVE SOFTWARE QUALITY***
  - ***DECREASE COSTS***
  - ***REFINE SCHEDULES***

SPI SUMMARY

- **WHAT?**

  WHAT IS INVOLVED IN SOFTWARE PROCESS IMPROVEMENT?

  - **CMM WAS DEVELOPED BY THE DoD-SPONSORED SOFTWARE ENGINEERING INSTITUTE (SEI)**

  - DEVELOPMENT AND MAINTENANCE OF THE CMM BASED **SYSTEM MODIFICATION SCENARIO (SMS)**

SPI SUMMARY

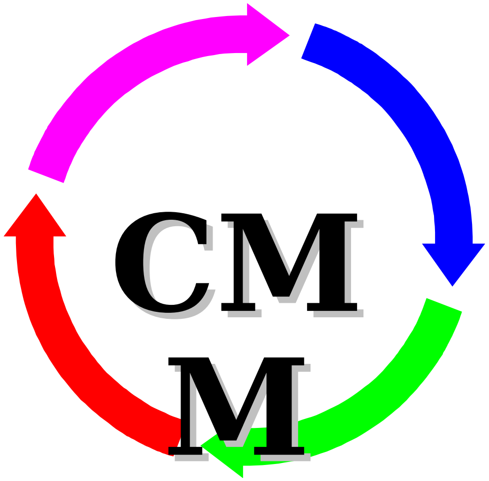
- **WHY?**
  - **WE MUST:**
    - **IMPROVE OUR *RELIABILITY***
    - **REDUCE DEVELOPMENT *COSTS***
    - **IMPROVE *EFFICIENCY* ACROSS THE ENTIRE DFAS**

SPI SUMMARY

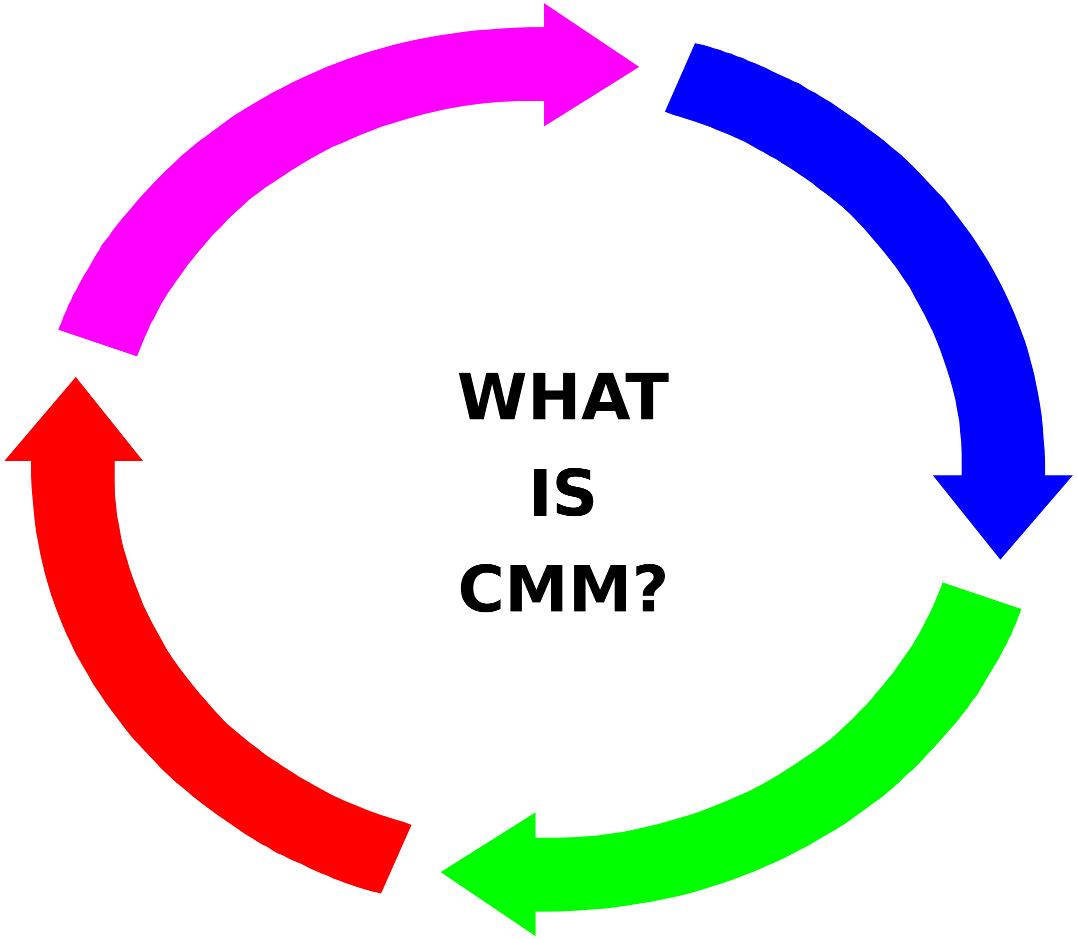
- **WHEN?**
  - ***CONTINUOUS***
- **HOW?**
  - **SPA, SEPG, CMM, AND SMS**
  - **BELIEF THAT *IMPROVEMENT IS POSSIBLE!!!***
  - **COMMITMENT**
  - **INVOLVEMENT**

CAPABILITY MATURITY MODEL (CMM)

CAPABILITY MATURITY MODEL (CMM) MODULE



- **MODULE OBJECTIVES:**
  - **WHAT IS THE CMM ?**
  - **IDENTIFY THE MATURITY LEVELS OF THE CMM**
  - **DEFINE THE KEY PROCESS AREAS (KPA)**



WHAT IS CMM?

WHAT IS THE CAPABILITY MATURITY MODEL?

“ A framework that describes the key

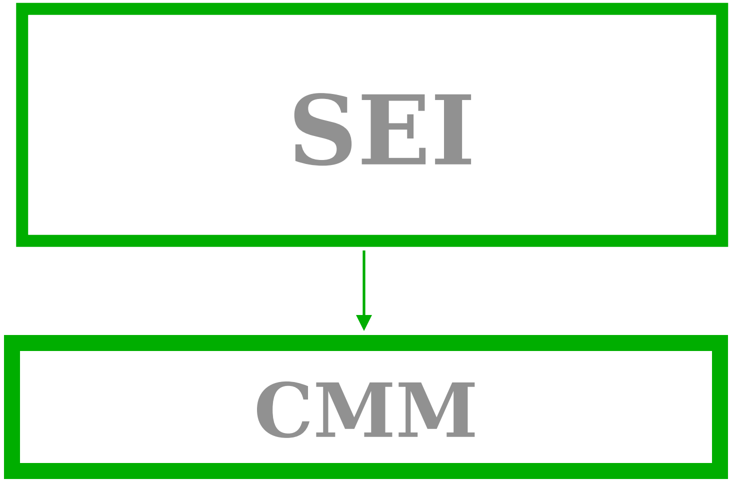
elements of an effective software proce

CMM

- **PROVIDES *GUIDELINES* FOR:**
  - **PLANNING**
  - **ENGINEERING**
  - **MANAGING SOFTWARE DEVELOPMENT**
  - **DEVELOPMENT**
  - **MAINTENANCE**

WHERE DID CMM ORIGINATE?

- THE CMM PROCESS MODEL WAS DEVELOPED BY THE **SOFTWARE ENGINEERING INSTITUTE (SEI)**
- IT IS OWNED BY THE NATIONAL SOFTWARE COMMUNITY
- SEI EXERCISES STEWARDSHIP OVER CMM



SEI

CMM

WHAT IS THE SOFTWARE ENGINEERING INSTITUTE (SEI)??

- A FEDERALLY FUNDED RESEARCH & DEVELOPMENT CENTER (FFRDC)
- FUNDED BY DoD
- AFFILIATED WITH CARNEGIE MELLON UNIVERSITY

WHAT IS THE SEI MISSION:

TO PROVIDE LEADERSHIP IN
ADVANCING THE
STATE-OF-THE-PRACTICE
OF SOFTWARE ENGINEERING
TO IMPROVE THE QUALITY OF
SYSTEMS WHICH DEPEND
UPON SOFTWARE

SOFTWARE PROCESS IMPROVEMENT PROCESS MANAGEMENT PREMISE

THE QUALITY OF A SOFTWARE SYSTEM IS GOVERNED BY THE QUALITY OF THE PROCESSES USED TO DEVELOP AND MAINTAIN IT.

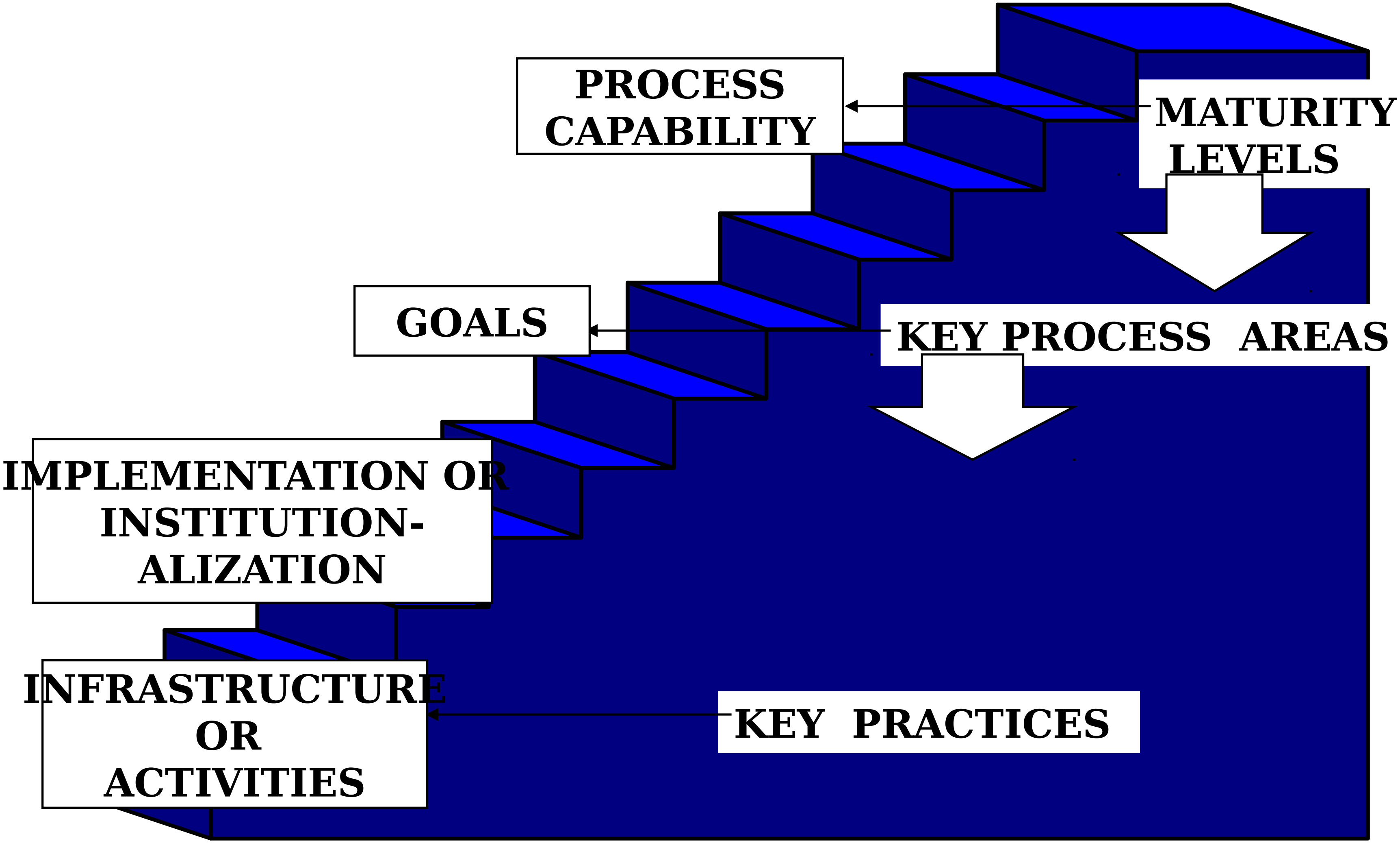
WHAT IS A PROCESS?

- A MEANS BY WHICH A DESIRED END RESULT IS PRODUCED BY THE INTEGRATION OF:
  - PEOPLE
  - PROCEDURES
  - METHODS
  - EQUIPMENT, *AND*...
  - TOOLS

HOW DO WE IMPROVE THE PROCESS ??

- **BY USE OF THE *CAPABILITY MATURITY MODEL (CMM)* .. A PROCESS MODEL DEVELOPED BY THE SOFTWARE ENGINEERING INSTITUTE (SEI)**

STRUCTURE OF THE CMM



PROCESS CAPABILITY

MATURITY LEVELS

GOALS

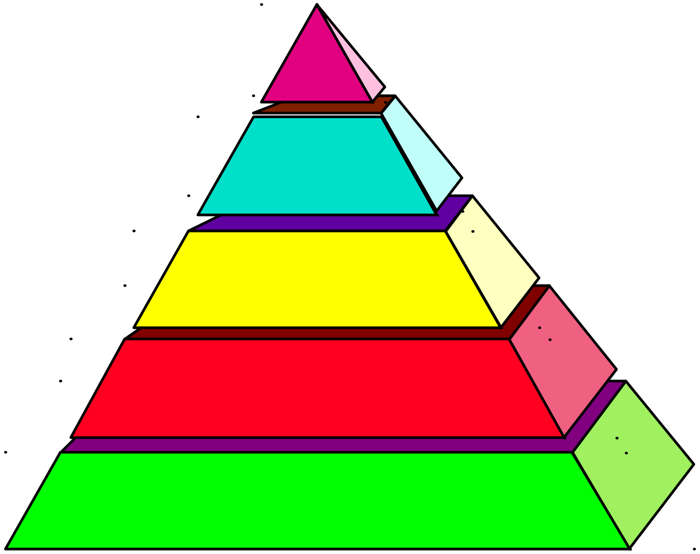
KEY PROCESS AREAS

IMPLEMENTATION OR INSTITUTION-ALIZATION

INFRASTRUCTURE OR ACTIVITIES

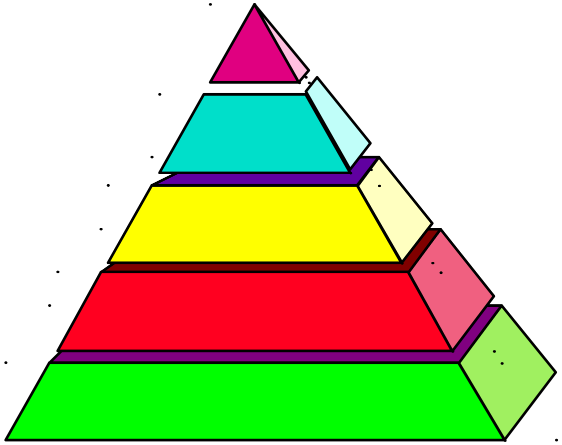
KEY PRACTICES

THE FIVE MATURITY LEVELS OF THE



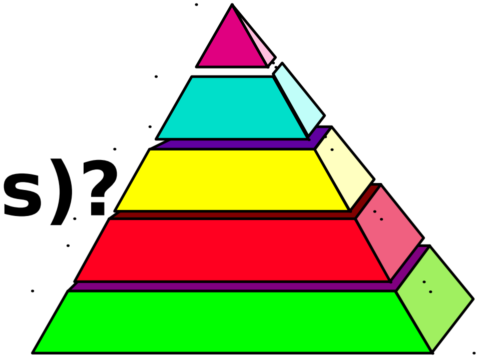
CMM

WHAT IS A MATURITY LEVEL?



- A MATURITY LEVEL IS A WELL-DEFINED EVOLUTIONARY PLATEAU ON THE PATH TOWARD BECOMING A MATURE SOFTWARE ORGANIZATION
- THERE ARE FIVE MATURITY LEVELS IN THE CMM
- EACH LEVEL IS A LAYER IN THE FOUNDATION FOR CONTINUOUS PROCESS IMPROVEMENT

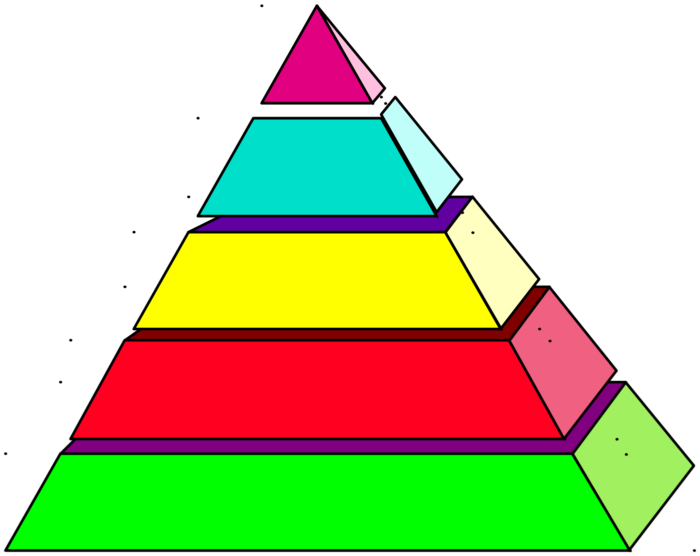
WHAT ARE KEY PROCESS AREAS (KPAs)?



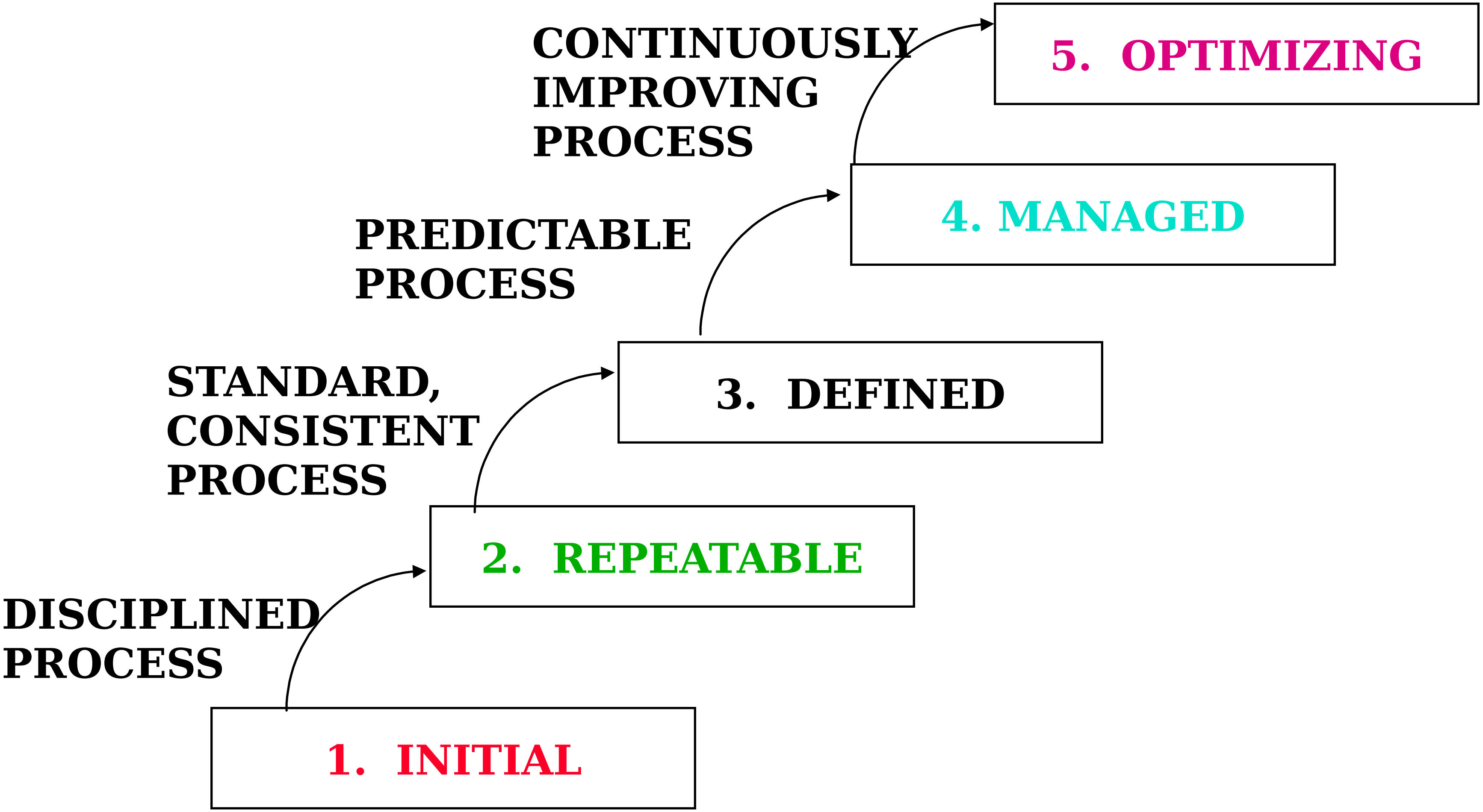
- A GROUP OF RELATED ACTIVITIES PERFORMED COLLECTIVELY TO ACHIEVE A SET OF GOALS
- KPAs ARE ***THE MAJOR BUILDING BLOCKS IN ESTABLISHING THE PROCESS CAPABILITY*** OF AN ORGANIZATION
  - DEFINITION OF ***PROCESS CAPABILITY:*** IT DESCRIBES THE RANGE OF EXPECTED RESULTS FROM FOLLOWING A PROCESS

WHAT ARE THE FIVE LEVELS OF THE CAPABILITY MATURITY MODEL (CMM)?

- OPTIMIZING
- MANAGED
- DEFINED
- REPEATABLE
- INITIAL



THE FIVE MATURITY LEVELS OF THE CMM



5. OPTIMIZING

CONTINUOUSLY IMPROVING PROCESS

4. MANAGED

PREDICTABLE PROCESS

3. DEFINED

STANDARD, CONSISTENT PROCESS

2. REPEATABLE

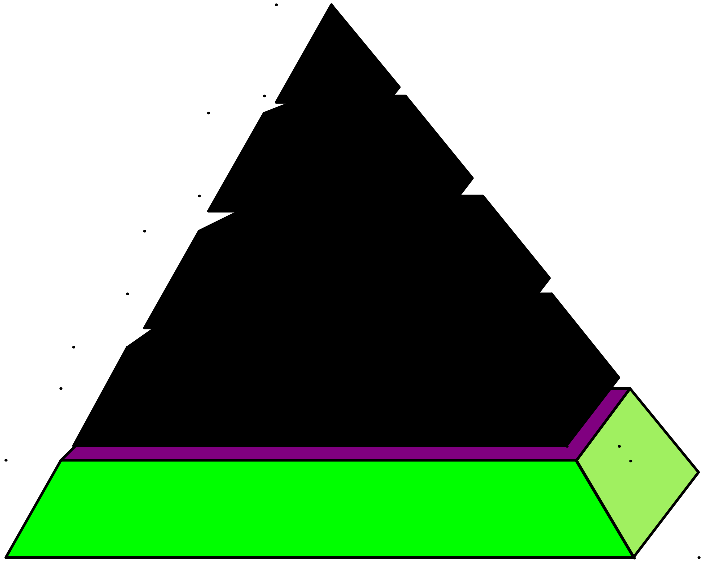
DISCIPLINED PROCESS

1. INITIAL

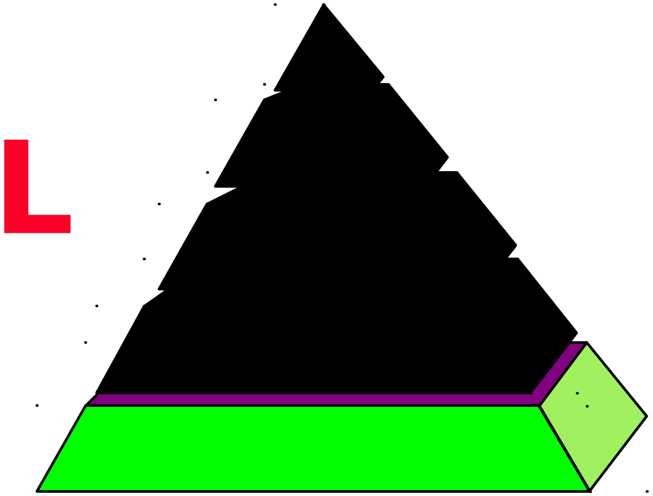
LEVEL 1

INITIAL

WHERE WE STARTED!

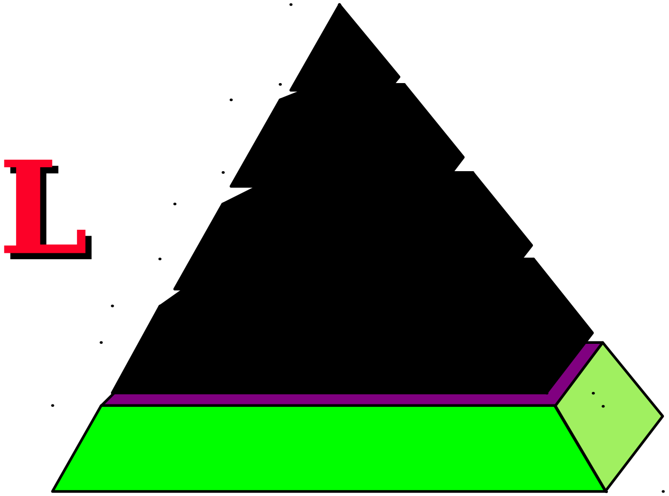


INITIAL LEVEL



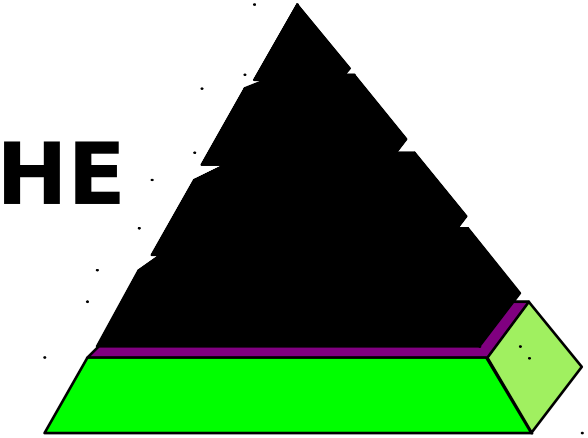
- **PROCESS IS:**
  - ***AD HOC***
  - **OCCASIONALLY *CHAOTIC***
  - **FEW PROCESSES ARE DEFINED**
  - **SUCCESS *DEPENDS ON* INDIVIDUAL EFFORT (*"HEROES"*)...**

INITIAL LEVEL

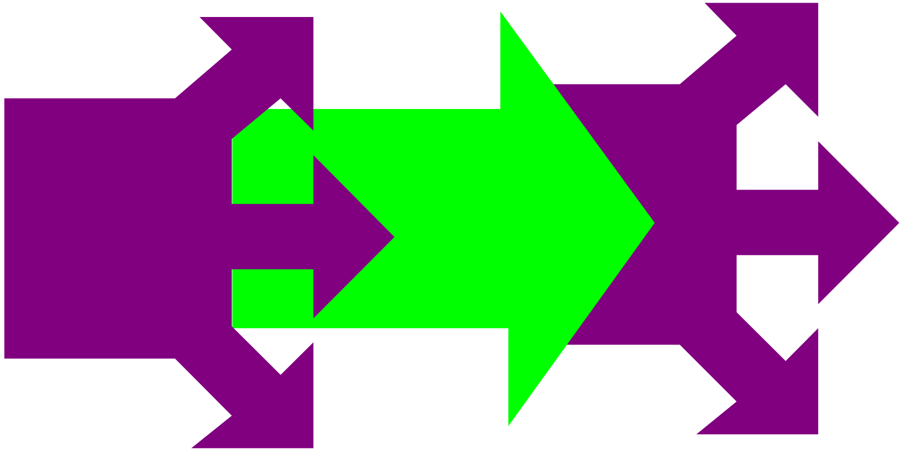


- **PROCESS (CONT'D):**
  - **HAS FEW FORMAL PROCEDURES, COST ESTIMATES, OR PROJECT PLANS**
  - **LIMITED MANAGEMENT MECHANISM TO ENSURE PROCEDURES ARE FOLLOWED**
  - **TOOLS NOT WELL INTEGRATED**
  - **CHANGE CONTROL LAX**

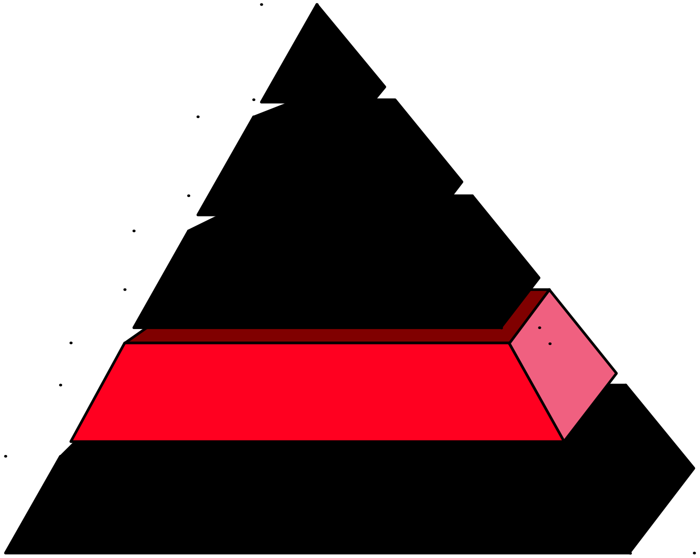
LEVEL 1
MANAGEMENT VIEW OF THE SOFTWARE PROCESS



- REQUIREMENTS FLOW IN
- THE SOFTWARE PRODUCT IS (USUALLY) PRODUCED BY SOME AMORPHOUS PROCESS
- THE PRODUCT FLOWS OUT ***AND HOPEFULLY*** IT WILL WORK



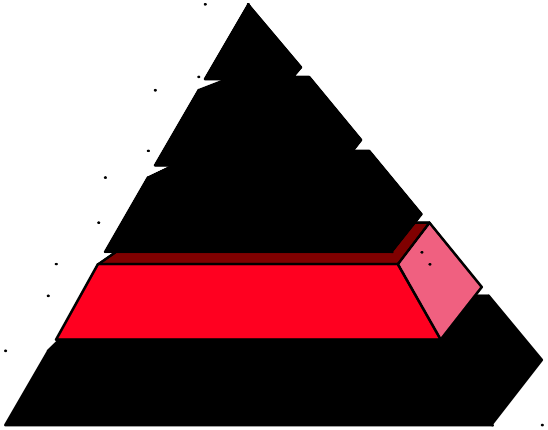
LEVEL 2
REPEATABLE



WHERE WE ARE NOW !

LEVEL 2

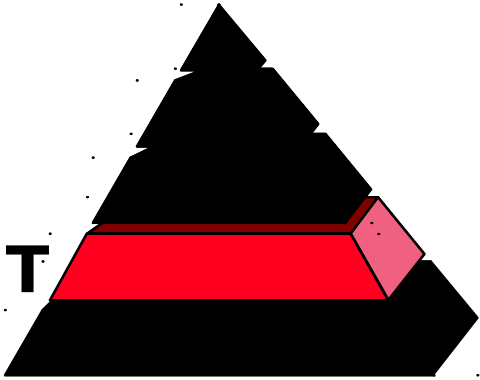
REPEATABLE



- **FOCUS:**
  - **PROJECT MANAGEMENT**
- **KEY PROCESS AREAS:**
  - **REQUIREMENTS MANAGEMENT**
  - **SOFTWARE PROJECT PLANNING**
  - **SOFTWARE PROJECT TRACKING**
  - **SOFTWARE SUBCONTRACT MANAGEMENT**
  - **SOFTWARE QUALITY ASSURANCE**
  - **SOFTWARE CONFIGURATION MANAGEMENT**

LEVEL 2

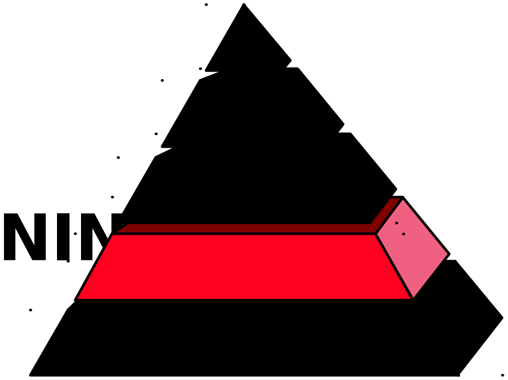
KPA: REQUIREMENTS MANAGEMENT



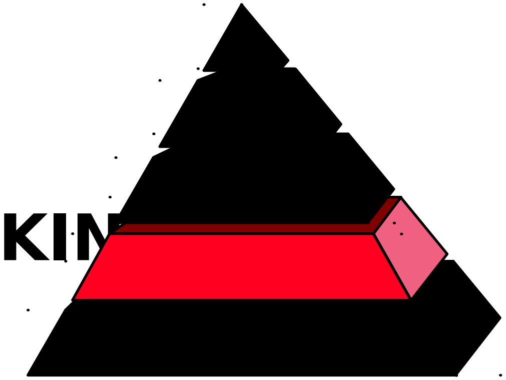
- ESTABLISH & MAINTAIN UNDERSTANDING AND AGREEMENT WITH CUSTOMER ON REQUIREMENTS FOR SOFTWARE THROUGHOUT ITS LIFE CYCLE
- BASIS FOR ESTIMATING, PLANNING, PERFORMING & TRACKING THE PROJECT’S SOFTWARE ACTIVITIES
- CUSTOMER MAY BE AN EXTERNAL OR INTERNAL CUSTOMER

LEVEL 2

KPA: SOFTWARE PROJECT PLANNIN



- DEVELOP ESTIMATES FOR WORK TO BE DONE
- ESTABLISH COMMITMENTS
- DEFINE THE PLAN TO PERFORM THE WORK
- PROVIDE BASIS FOR INITIATING SOFTWARE EFFORT
- MANAGE PROGRESS OF THE WORK



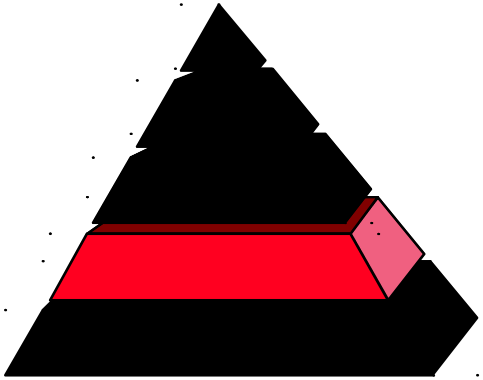
LEVEL 2

KPA: SOFTWARE PROJECT TRACKIN AND OVERSIGHT

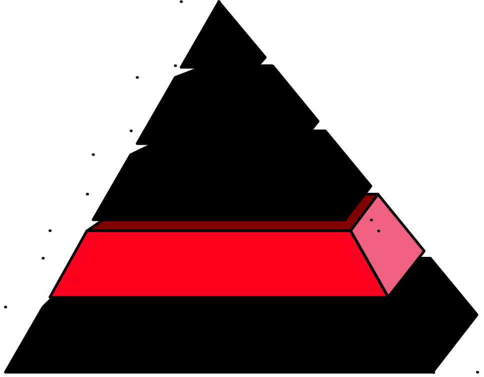
- TRACK AND REVIEW SOFTWARE ACCOMPLISHMENTS & RESULTS USING:
  - DOCUMENTED ESTIMATES
  - COMMITMENTS
  - PLANS
- BASED ON ACCOMPLISHMENTS AND RESULTS, ADJUST:
  - ESTIMATES
  - COMMITMENTS
  - PLANS

LEVEL 2

KPA: SOFTWARE SUBCONTRACT MANAGEMENT



- SELECT SOFTWARE SUBCONTRACTOR
- ESTABLISH COMMITMENT WITH THE SUBCONTRACTOR ON WORK TO BE PERFORMED
- COORDINATE ACTIVITIES WITH THE SUBCONTRACTOR
- TRACK AND REVIEW THE SUBCONTRACTOR'S :
  - PERFORMANCE
  - RESULTS



LEVEL 2

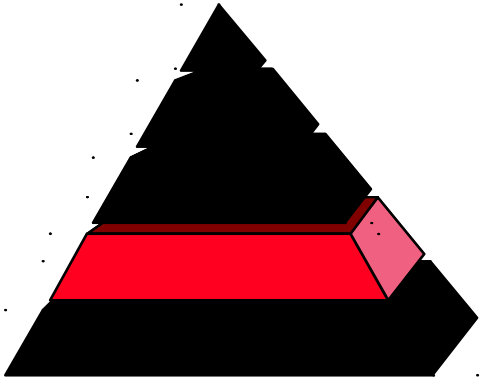
KPA: SOFTWARE QUALITY ASSURANCE (SQA)

- PARTICIPATE IN DEFINITION OF STANDARDS FOR PRODUCT AND PROCESS
- REVIEW AND AUDIT THE SOFTWARE PRODUCTS AND ACTIVITIES TO ENSURE THEY COMPLY WITH APPLICABLE :
  - PROCESSES
  - STANDARDS
  - PROCEDURES

(CONT’D)

LEVEL 2

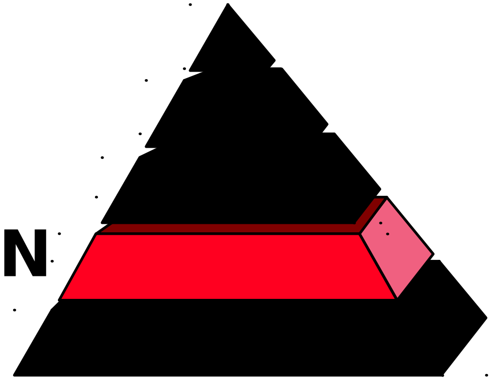
KPA: SOFTWARE QUALITY ASSURANCE (CONT'D)



- PROVIDE FEEDBACK TO DEVELOPERS AND MANAGEMENT ON PRODUCT AND PROCESS STATUS RELATIVE TO REVIEW PARAMETERS

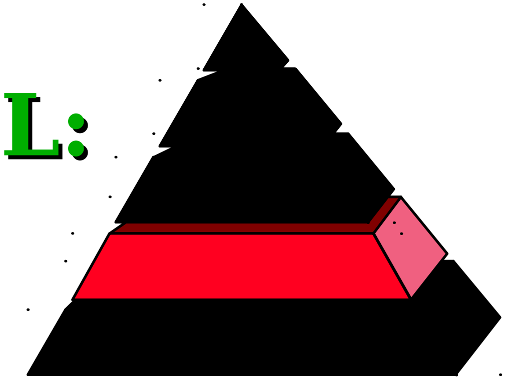
LEVEL 2

KPA: SOFTWARE CONFIGURATION MANAGEMENT



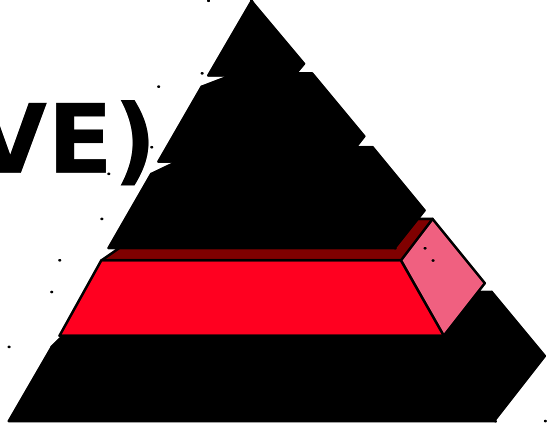
- IDENTIFY CONFIGURATION ITEMS/UNITS
- CONTROL ITEMS AND CHANGES TO THEM
- RECORD/REPORT STATUS AND CHANGE ACTIVITY FOR THE ITEMS
- ESTABLISH & MAINTAIN CONFIGURATION MANAGEMENT LIBRARY SYSTEM TO SUPPORT THE SOFTWARE BASELINE LIBRARY

AT THE REPEATABLE LEVEL:



- BASIC PROJECT MANAGEMENT PROCESSES ARE ESTABLISHED TO:
  - TRACK COST, SCHEDULE, AND FUNCTIONALITY
- PROCESS DISCIPLINE IS IN PLACE TO:
  - REPEAT EARLIER SUCCESSES ON PROJECTS WITH SIMILAR APPLICATIONS

REPEATABLE (INTUITIVE) LEVEL 2 *CHARACTERISTICS*

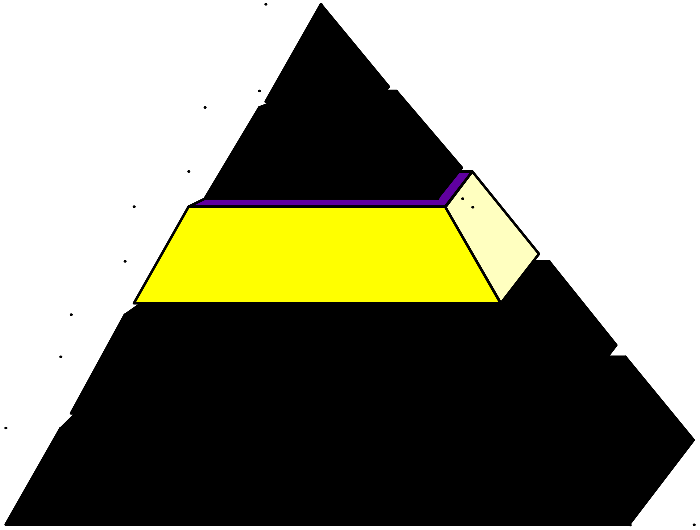


- PROCESS INDEPENDENT OF INDIVIDUALS
- ESTABLISHED BASIC PROJECT CONTROLS
- STRENGTH IN DOING SIMILAR WORK BUT STILL FACE MAJOR RISK WHEN PRESENTED WITH NEW CHALLENGES
- BASIS FOR ORDERLY FRAMEWORK FOR FURTHER IMPROVEMENT

REVIEW: WHY REPEATABLE LEVEL 2??

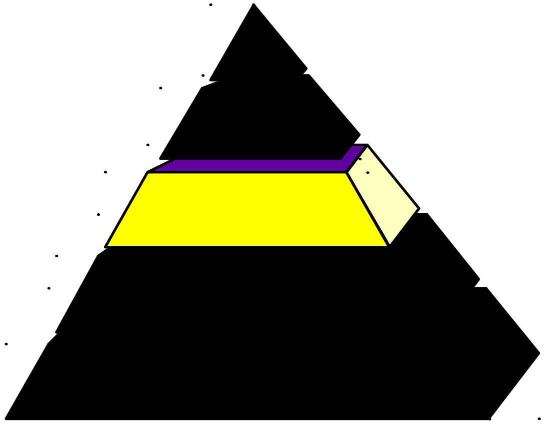
- INCREASES OUR COMPETITIVENESS
- IMPROVES COST, SCHEDULE, & QUALITY
- PROVIDES DEFINED & DOCUMENTED PROCESSES
- IMPROVES OUR ABILITY TO REPEAT SUCCESS

LEVEL 3
DEFINED



WHERE WE WANT TO BE SOON

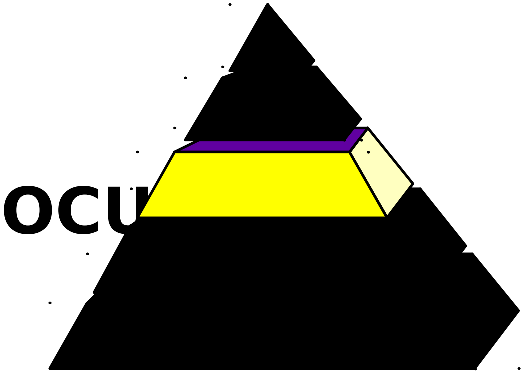
LEVEL 3
DEFINED



- FOCUS:
  - ENGINEERING PROCESS
- KEY PROCESS AREAS
  - ORGANIZATION PROCESS FOCUS
  - ORGANIZATION PROCESS DEFINITION
  - TRAINING PROGRAM
  - INTEGRATED SOFTWARE MANAGEMENT
  - SOFTWARE PRODUCT ENGINEERING
  - INTERGROUP COORDINATION
  - PEER REVIEWS

LEVEL 3

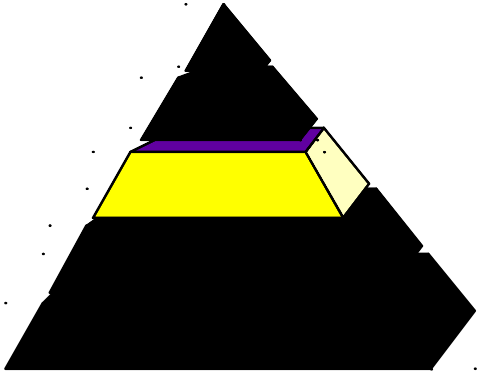
KPA: ORGANIZATION PROCESS FOCU



- ESTABLISH THE ORGANIZATIONAL RESPONSIBILITY FOR SOFTWARE PROCESS ACTIVITIES THAT IMPROVE OVERALL SOFTWARE PROCESS CAPABILITY
- DEVELOP AND MAINTAIN UNDERSTANDING OF THE ORGANIZATION’S AND PROJECTS’ SOFTWARE PROCESSES
- COORDINATE ACTIVITIES TO ASSESS, DEVELOP, MAINTAIN, AND IMPROVE THESE PROCESSES

LEVEL 3

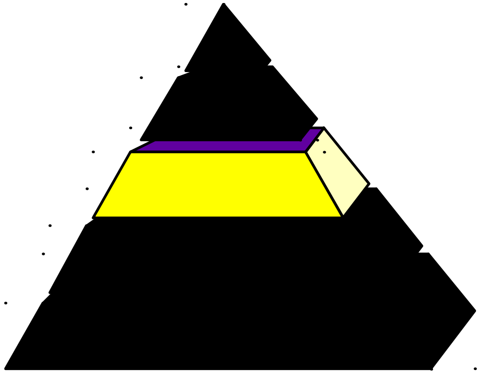
KPA: ORGANIZATION PROCESS DEFINITION



- DEVELOP AND MAINTAIN THE ORGANIZATION’S STANDARD SOFTWARE PROCESS
- DEVELOP AND MAINTAIN A USABLE SET OF SOFTWARE PROCESS ASSETS, SUCH AS TAILORING GUIDELINES, SOFTWARE PROCESS DATABASE, AND A LIBRARY OF SOFTWARE PROCESS-RELATED DOCUMENTATION

LEVEL 3

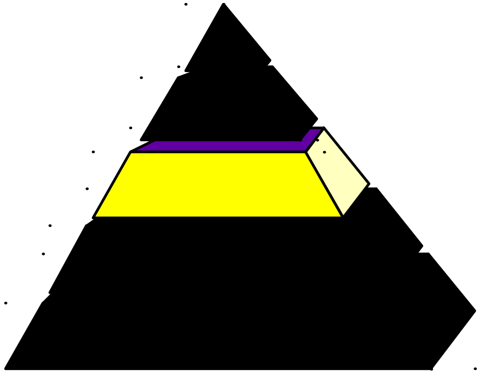
KPA: TRAINING PROGRAM



- DEVELOP THE SKILLS AND KNOWLEDGE OF INDIVIDUALS SO THEY CAN PERFORM THEIR ROLES
- IDENTIFY TRAINING NEEDS OF THE ORGANIZATION, PROJECTS, AND INDIVIDUALS
- DEVELOP OR PROCURE TRAINING TO ADDRESS IDENTIFIED NEEDS

LEVEL 3

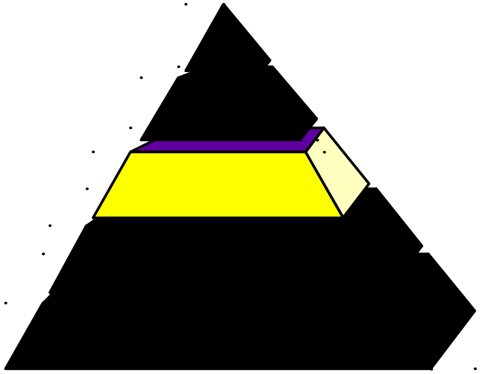
KPA: INTEGRATED SOFTWARE MANAGEMENT



- INTEGRATE SOFTWARE ENGINEERING AND MANAGEMENT ACTIVITIES INTO A DEFINED SOFTWARE PROCESS TAILORED FROM THE ORGANIZATION’S STANDARD SOFTWARE PROCESS
- TAILOR THE ORGANIZATION’S STANDARD SOFTWARE PROCESS BASED ON THE BUSINESS ENVIRONMENT AND TECHNICAL NEEDS OF THE PROJECT

LEVEL 3

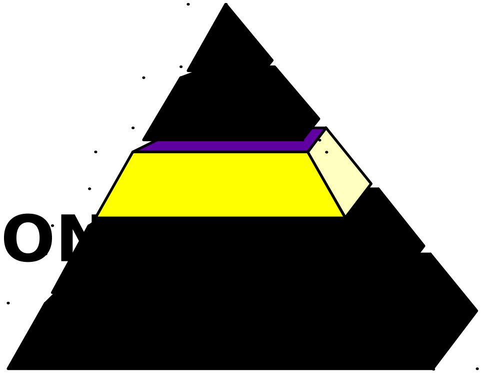
KPA: SOFTWARE PRODUCT ENGINEERING



- PERFORM A WELL-DEFINED ENGINEERING PROCESS THAT INTEGRATES ALL THE SOFTWARE ENGINEERING ACTIVITIES
- DOCUMENT THE SOFTWARE WORK PRODUCTS AND MAINTAIN TRACEABILITY AND CONSISTENCY BETWEEN THEM

LEVEL 3

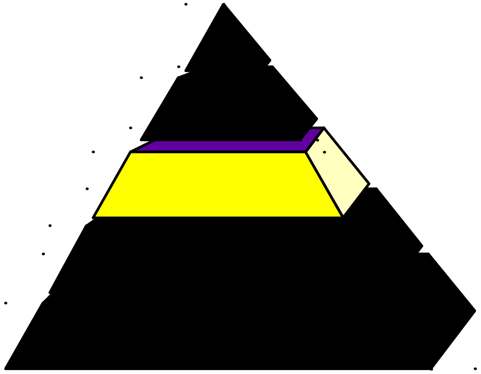
KPA: INTERGROUP COORDINATION



- **ESTABLISH MEANS FOR SOFTWARE ENGINEERING GROUPS TO WORK PROACTIVELY WITH OTHER ENGINEERING GROUPS TO ADDRESS SYSTEM-LEVEL REQUIREMENTS, OBJECTIVES, AND ISSUES**

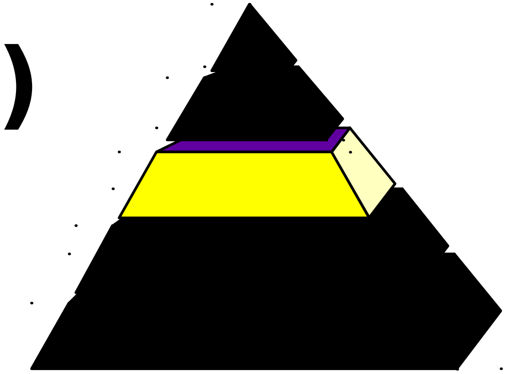
LEVEL 3

KPA: PEER REVIEWS



- **REMOVE DEFECTS FROM THE SOFTWARE WORK PRODUCTS EARLY**
- **DEVELOP A BETTER UNDERSTANDING OF THE SOFTWARE WORK PRODUCTS AND OF THE DEFECTS THAT CAN BE PREVENTED**

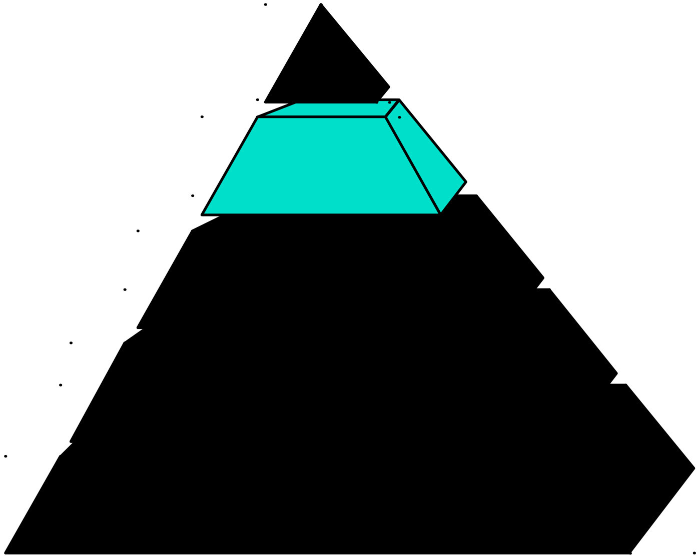
DEFINED (QUALITATIVE) LEVEL 3 *CHARACTERISTICS*



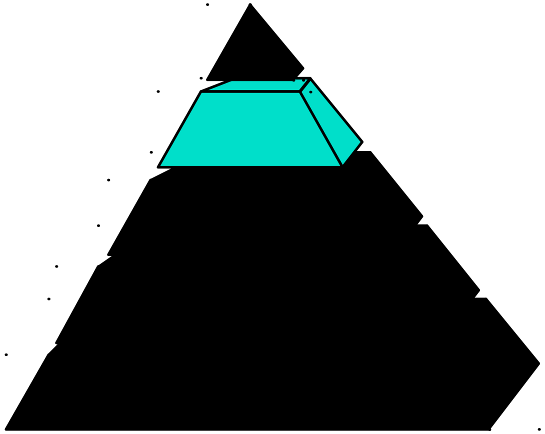
- **THE PROCESS IS DEFINED AND INSTITUTIONALIZED**
- **SOFTWARE ENGINEERING PROCESS GROUP ESTABLISHED TO LEAD PROCESS IMPROVEMENT**

LEVEL 4

MANAGED



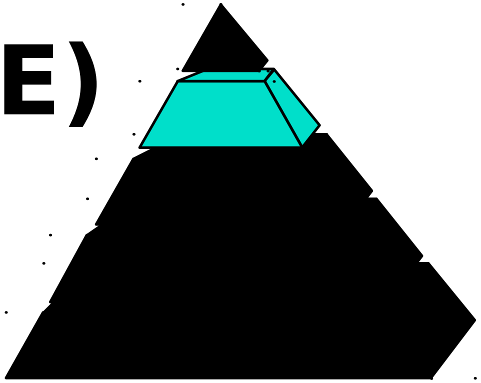
LEVEL 4
MANAGED



- **FOCUS:**
  - **PRODUCT AND PROCESS QUALITY**

- **KEY PROCESS AREAS**
  - **SOFTWARE QUALITY MANAGEMENT**
  - **QUANTITATIVE PROCESS MANAGEMENT**

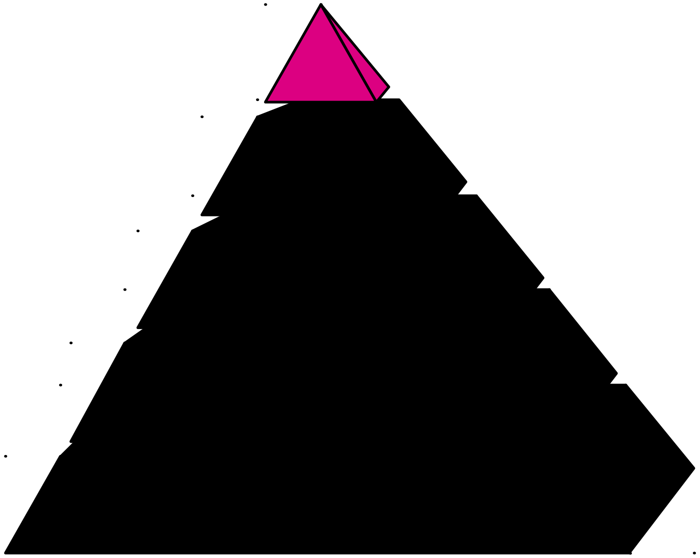
MANAGED (QUANTITATIVE) LEVEL 4 *CHARACTERISTICS*



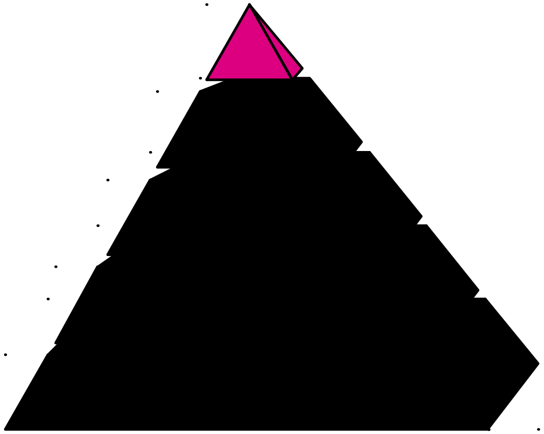
- MEASURED PROCESS
- MINIMUM SET OF QUALITY AND PRODUCTIVITY MEASUREMENT SETS ESTABLISHED
- PROCESS DATABASE ESTABLISHED WITH RESOURCES TO ANALYZE ITS DATA AND MAINTAIN IT

LEVEL 5

OPTIMIZING

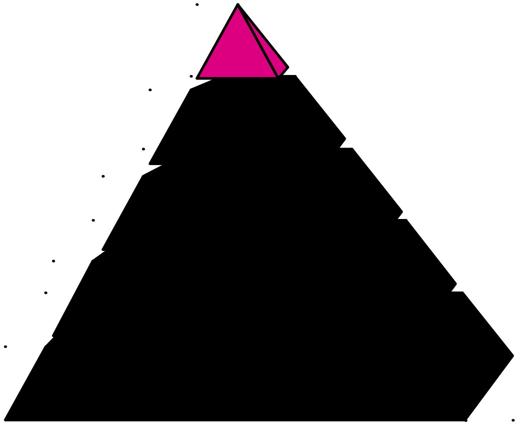


OPTIMIZING LEVEL



- **CONTINUOUS PROCESS IMPROVEMENT ENABLED BY QUANTITATIVE OR MEASURABLE FEEDBACK FROM:**
  - **THE PROCESS**
  - **TESTING INNOVATIVE IDEAS**
  - **TESTING INNOVATIVE TECHNOLOGIES**

OPTIMIZING
LEVEL 5
CHARACTERISTICS



- IMPROVEMENTS FED BACK INTO THE PROCESS
- DATA GATHERING AUTOMATED AND USED TO IDENTIFY WEAKEST PROCESS ELEMENTS
- NUMERICAL EVIDENCE USED TO JUSTIFY APPLICATION OF TECHNOLOGY TO CRITICAL TASKS
- RIGOROUS DEFECT-CAUSE ANALYSIS AND DEFECT PREVENTION